

**What is claimed is:**

1. An RF filtering and amplifying apparatus, comprising:

a plurality of RF filters, connected with each other in a manner of cascade, for filtering the received radio signal level by level;

5 a LNA (low noise amplifier), for amplifying the filtered signal to output an amplified and filtered signal.

2. The apparatus according to claim 1, further comprising:

a control unit, for generating a control signal according to the frequency band of the received radio signal;

10 wherein:

each of said plurality of RF filters tunes to the corresponding operating band to filter the radio signal in the receive frequency band level by level;

said LNA tunes to the corresponding operating band according to the control signal, to amplify the filtered signal in the corresponding frequency band, so as to output an amplified and filtered signal in the corresponding frequency band.

3. The apparatus according to claim 1, further comprising:

a plurality of LNAs, each located between two adjacent RF filters of said plurality of RF filters, for amplifying the signal outputted by the RF filter in front of said LNA.

4. The apparatus according to claim 2, further comprising:

a plurality of LNAs, each located between two adjacent RF filters of said plurality of RF filters, and tuning to the corresponding operating band according to said control signal, so as to amplify the signal in the corresponding frequency band outputted by the RF filter in front of said LNA.

5. The apparatus according to claim 3 or 4, wherein each of said plurality of RF filters has different selectivity.

6. The apparatus according to claim 3 or 4, wherein the cascade mode adopted by said plurality of RF filters is to place RF filters with less insertion

loss in front of RF filters with relatively higher in section loss.

7. An RF filtering and amplifying apparatus, comprising:

a control unit, for generating a control signal according to the frequency band of the received radio signal;

5 a plurality of RF processing modules, corresponding to a plurality of radio links, wherein each RF processing module filters and amplifies the radio signal in the corresponding frequency band to output an amplified and filtered signal in the corresponding frequency band;

10 a front-end band switching unit, for switching the received radio signal in the corresponding frequency band to the RF processing module in the corresponding frequency band of the plurality of RF processing modules, according to the control signal;

15 a back-end band switching unit, for switching to the RF processing module in the corresponding frequency band, so as to receive the amplified and filtered signal in the corresponding frequency band outputted from the RF processing module.

8. The apparatus according to claim 7, wherein each of said RF processing modules includes:

20 a plurality of RF filters, connected with each other in a manner of cascade, for filtering the received radio signal level by level;

a LNA, for amplifying the filtered signal to output an amplified and filtered signal.

9. The apparatus according to claim 8, further comprising:

25 a plurality of LNAs, each of which is located between two adjacent RF filters of said plurality of RF filters, for amplifying the signal outputted by the RF filter in front of the LNA.

10. The apparatus according to claim 9, wherein each of said plurality of RF filters has different selectivity.

11. The apparatus according to claim 9, wherein the cascade mode adopted

by said plurality of RF filters is to place RF filters with less insertion loss in front of RF filters with relatively higher insertion loss.

12. The apparatus according to claim 9, wherein at least two LNAs behind the RF filters at the same level in at least two RF processing modules of said plurality of RF processing modules, form a LNA, and the formed LNA amplifies the filtered signal of the RF filters from the RF processing modules in the corresponding frequency band, and provides the amplified signal to the RF filters at next level in the RF processing module in the corresponding frequency band.

13. The apparatus according to claim 12, further comprising:  
a tunable RF processing module, for filtering and amplifying the received radio signal in the corresponding frequency band according to said control signal, and providing the amplified and filtered signal in the corresponding frequency band to said front-end band switching unit.

14. The apparatus according to claim 13, wherein said tunable RF processing module includes:

at least one RF filter, for filtering the received radio signal in the corresponding frequency band according to said control signal;

at least one LNA, for amplifying the filtered signal to output an amplified and filtered signal in the corresponding frequency band.

15. The apparatus according to claim 12, further comprising:

a tunable RF processing module, for receiving the output signal in the corresponding frequency band from said back-end band switching unit according to said control signal, and filtering and amplifying the output signal in the corresponding frequency band.

16. The apparatus according to claim 15, wherein said tunable RF processing module includes:

at least one RF filter, for filtering the output signal in the corresponding frequency band from said back-end band switching unit, according to said

control signal;

at least one LNA, for amplifying the filtered signal to output an amplified and filtered signal in the corresponding frequency band.

17. An apparatus for receiving radio signal, comprising:

5 a receiving unit, for receiving radio signal;

an RF filtering and amplifying unit, for filtering the received radio signal level by level, and amplifying the filtered signal;

an ADC, for analog-to-digital converting the amplified and filtered signal to get a digital signal;

10 a digital signal processing unit, for processing the digital signal.

18. The apparatus for receiving radio signal according to claim 17, wherein said RF filtering and amplifying unit includes:

a plurality of RF filters, connected with each other in a manner of cascade, for filtering the received radio signal level by level;

15 a LNA, for amplifying the filtered signal to output an amplified and filtered signal.

19. The apparatus for receiving radio signal according to claim 18, wherein:

said digital signal processing unit, generates a control signal according to the frequency band of the received radio signal;

20 each of said plurality of RF filters, tunes to the corresponding operating band according to the control signal, to filter the radio signal in the receive frequency band level by level;

said LNA, tunes to the corresponding operating band according to the control signal, to amplify the filtered signal in the corresponding frequency band, thus outputs an amplified and filtered signal in the corresponding frequency band.

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20. The apparatus for receiving radio signal according to claim 18, further comprising:

a plurality of LNAs, each of which is located between two adjacent RF

filters of said plurality of RF filters, for amplifying the signal outputted by the RF filter in front of the LNA.

21. The apparatus for receiving radio signal according to claim 19, further comprising:

5           a plurality of LNAs, each of which is located between two adjacent RF filters of said plurality of RF filters, for tuning to the corresponding operating band according to said control signal, to amplify the signal in the corresponding frequency band outputted by the RF filter in front of the LNA.

22. The apparatus for receiving radio signal according to claim 17, wherein:

10           said digital signal processing unit, for generating a control signal according to the frequency band of the received radio signal;

          said RF filtering and amplifying unit, comprising:

          a plurality of RF processing modules, each of which filters and amplifies the radio signal in the corresponding frequency band, to output an amplified and filtered signal in the corresponding frequency band ;

15           a front-end band switching unit, for switching the received radio signal in the corresponding frequency band to the RF processing module in the corresponding frequency band in said plurality of RF processing modules, according to the control signal;

20           a back-end band switching unit, for switching to the RF processing module in the corresponding frequency band according to the control signal, so as to receive the amplified and filtered signal in the corresponding frequency band outputted from the RF processing module.

23. The apparatus for receiving radio signal according to claim 22, wherein each of said RF processing module includes:

25           a plurality of RF filters, connected with each other in a manner of cascade, for filtering the received radio signal level by level;

          a LNA, for amplifying the filtered signal to output an amplified and filtered signal.

24. The apparatus for receiving radio signal according to claim 23, further comprising:

5 a plurality of LNAs, each of which is located between two adjacent RF filters of said plurality of RF filters, for amplifying the signal outputted by the RF filter in front of the LNA.

25. The apparatus for receiving radio signal according to claim 24, further comprising:

10 a tunable RF processing module, for filtering and amplifying the received radio signal in the corresponding frequency band according to said control signal, and providing the amplified and filtered signal in the corresponding frequency band to said front -end band switching unit.

26. The apparatus for receiving radio signal according to claim 25, wherein said tunable RF processing module includes:

15 at least one RF filter, for filtering the received radio signal in the corresponding frequency band according to said control signal;

at least one LNA, for amplifying the filtered signal to output an amplified and filtered signal in the corresponding frequency band.

27. The apparatus for receiving radio signal according to claim 24, further comprising:

20 a tunable RF processing module, for receiving the output signal in the corresponding frequency band from said back -end band switching unit according to said control signal, and filtering and amplifying the output signal in the corresponding frequency band.

28. The apparatus for receiving radio signal according to claim 27, wherein said tunable RF processing module includes:

25 at least one RF filter, for filtering the output signal in the corresponding frequency band from said back -end band switching unit, according to said control signal;

at least one LNA, for amplifying the filtered signal to output an amplified

and filtered signal in the corresponding frequency band.

29. An RF filtering and amplifying method, comprising steps of:

filtering the received radio signal level by level;

amplifying the filtered signal to output an amplified and filtered signal;

5 generating a control signal according to the frequency band of the received radio signal;

filtering the radio signal in the receive frequency band level by level according to the control signal;

10 amplifying the filtered signal in the corresponding frequency band according to the control signal, so as to output an amplified and filtered signal in the corresponding frequency band.

30. An RF filtering and amplifying method, comprising steps of:

(a) generating a control signal according to the frequency band of the received radio signal;

15 (b) switching the received radio signal in the corresponding frequency band to the RF processing sector in the corresponding frequency band according to the control signal;

(c) filtering and amplifying the radio signal in the corresponding frequency band, to output an amplified and filtered signal in the corresponding frequency band;

20 (d) switching to the RF processing sector in the corresponding frequency band according to the control signal, to receive the amplified and filtered signal in the corresponding frequency band.

31. The method according to claim 30, wherein step (c) includes:

25 filtering said received radio signal level by level;

amplifying the filtered signal to output an amplified and filtered signal.